

**What is claimed is:**

1. A method of determining in situ a desired formation parameter of interest comprising:

- 5        a) conveying a tool into a well borehole traversing a formation;
- b) establishing fluid communication between the tool and the formation, the tool having a test volume for accepting fluid from the formation;
- c) drawing fluid into the test volume, the drawing including a first draw portion and a second draw portion;
- 10      d) controlling a draw rate during at least one of the first draw portion and the second draw portion, the draw rate being controlled according to one or more of i) increasing the draw rate a plurality of times during the first draw portion, and ii) decreasing the draw rate a plurality of times during the second draw portion; and
- 15      e) determining at least one characteristic of the test volume during one or more of the first draw portion and the second draw portion, the determined characteristic being indicative of the formation parameter of interest.

2. The method of claim 1, wherein the borehole is deviated from vertical, the tool further including a pad sealing element for establishing fluid communication between the tool and the formation, the method further comprising performing a tool face measurement to provide an indication that the pad sealing element is not pushed against the formation where a cutting bed is located.

3. The method of claim 1, wherein establishing fluid communication includes exposing a port in the tool to a sealed portion of the borehole.

5 4. The method of claim 3 further comprising sealing a portion of the borehole using one or more of i) a packer sealing an annular portion of the borehole and ii) an extendable probe sealing a wall portion of the borehole.

10 5. The method of claim 1, wherein controlling the draw rate includes pumping fluid from the test volume using a variable rate pump.

6. The method of claim 1, wherein controlling the draw rate includes varying the volume of the test volume.

15 7. The method of claim 6, wherein varying the volume includes using a piston to vary the volume.

8. The method of claim 1, wherein determining at least one characteristic includes determining a first characteristic during the first draw portion and determining a second characteristic during the second draw portion.

20 9. The method of claim 1 further comprising:

- i) changing the draw rate when the test volume pressure is below a formation pressure to allow pressure in the test volume to increase toward the formation pressure; and
- ii) determining a second characteristic of the test volume during at least one of A) 5 while pressure in the test volume is increasing; and B) when the pressure in the test volume stabilizes.

10. The method of claim 9, wherein changing the draw rate is selected from one of i) changing the draw rate to substantially zero draw rate; and ii) decreasing the rate of 10 increase in draw rate such that flow from the formation is equal to or greater than the tool draw rate.

11. The method of claim 1, wherein determining the at least one characteristic includes determining one or more of i) a draw rate; ii) a piston rate; iii) a piston position; 15 iv) a pump rate; v) a fluid compressibility; vi) a flow rate from the test volume; vii) a flow rate into the test volume; viii) pressure of the test volume; ix) temperature in the test volume; x) volume of the test volume; and xi) composition of fluid in the test volume.

12. The method of claim 1, wherein determining the at least one characteristic 20 includes using formation rate analysis at least in part to determine the at least one characteristic.

13. The method of claim 12, wherein the formation rate analysis comprises determining the draw rate and compressibility of fluid in the test volume.

14. The method of claim 1, wherein increasing the draw rate includes at least one of i) 5 increasing the draw rate continuously during the first draw portion and ii) increasing the draw rate in a step-wise manner during the first draw portion.

15. The method of claim 1, wherein decreasing the draw rate includes at least one of i) 10 decreasing the draw rate continuously during the second draw portion and ii) decreasing the draw rate in a step-wise manner during the second draw portion.

16. An apparatus for determining in situ a desired formation parameter of interest comprising:

- a) a tool conveyable into a well borehole traversing a formation;
- 15 b) a test unit in the tool, the test unit being adapted for fluid communication with the formation, the test unit including a test volume for receiving fluid from the formation;
- c) a control device associated with the test volume for controlling a draw rate of the fluid being drawn into in the test volume, the control device being operable to control the draw rate according to one or more of i) increasing the draw rate a plurality of times during a first draw portion, and ii) 20 decreasing the draw rate a plurality of times during a second draw portion; and

d) a sensing device for determining at least one characteristic of the test volume during one or more of the first draw portion and the second draw portion, the determined characteristic being indicative of the formation parameter of interest.

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17. The apparatus of claim **16**, wherein the tool is conveyed in the borehole on one of i) a drill string; ii) a coiled tube; and iii) a wireline.

18. The apparatus of claim **16**, wherein the test unit further includes a port exposed to 10 a sealed portion of the borehole for establishing the fluid communication.

19. The apparatus of claim **18** further comprising one or more of i) a packer for sealing an annular portion of the borehole and ii) an extendable probe sealing a wall portion of the borehole.

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20. The apparatus of claim **16**, wherein the control device includes a variable rate pump for drawing fluid into the test volume.

21. The apparatus of claim **16**, wherein the test volume comprises a variable volume 20 and the control device controls the draw rate by varying the volume of the variable volume.

22. The apparatus of claim 21 further comprising a piston in the control device for varying the volume of the variable volume.
23. The apparatus of claim 16, wherein the at least one sensed characteristic is a first 5 characteristic sensed during the first draw portion and a second characteristic sensed during the second draw portion.
24. The apparatus of claim 16 further comprising a controller associated with the control device for changing the draw rate when a test volume pressure is below a 10 formation pressure to allow pressure in the test volume to increase toward the formation pressure, the sensing device determining a second characteristic of the test volume during at least one of A) while pressure in the test volume is increasing; and B) when the pressure in the test volume stabilizes.
- 15 25. The apparatus of claim 24, wherein the control device changes the draw rate by i) changing the draw rate to a substantially zero draw rate; and ii) decreasing a rate of increase in draw rate such that flow from the formation is equal to or greater than the tool draw rate.
- 20 26. The apparatus of claim 16, wherein the at least one characteristic includes one or more of i) a draw rate; ii) a piston rate; iii) a piston position; a pump rate; iv) a fluid compressibility; v) a flow rate from the test volume; vi) a flow rate into the test volume;

vii) pressure of the test volume; viii) temperature in the test volume; ix) volume of the test volume; and x) composition of fluid in the test volume.

27. The apparatus of claim **16** further comprising a processor receiving an output of  
5 the sensing device, the processor processing the received output using a formation rate analysis program to determine the at least one characteristic.

28. The apparatus of claim **27**, wherein received output includes the draw rate and compressibility of fluid in the test volume.

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29. The apparatus of claim **16**, wherein the control device increases the draw rate by at least one of i) increasing the draw rate continuously during the first draw portion and ii) increasing the draw rate in a step-wise manner during the first draw portion.

15 30. The apparatus of claim **16**, wherein the control device decreases the draw rate by at least one of i) decreasing the draw rate continuously during the second draw portion and ii) decreasing the draw rate in a step-wise manner during the second draw portion.

31. A system for determining in situ a desired formation parameter of interest  
20 comprising:

a) a work string for conveying a tool into a well borehole traversing a formation;

- b) a test unit in the tool, the test unit being adapted for fluid communication with the formation, the test unit including a test volume for receiving fluid from the formation;
- 5 c) a control device associated with the test volume for controlling a draw rate of the fluid being drawn into in the test volume, the control device being operable to control the draw rate according to one or more of i) increasing the draw rate a plurality of times during a first draw portion, and ii) decreasing the draw rate a plurality of times during a second draw portion;
- 10 d) a sensing device for determining at least one characteristic of the test volume during one or more of the first draw portion and the second draw portion;
- 15 e) a processor receiving an output of the sensing device, the processor processing the received output according to programmed instructions, the formation parameter of interest being determined at least in part by the processed output.

32. The system of claim 31, wherein the work string is selected from a group consisting of i) a drill string; ii) a coiled tube; and iii) a wireline.

20 33. The system of claim 31, wherein the test unit further includes a port exposed to a sealed portion of the borehole for establishing the fluid communication.

34. The system of claim **33** further comprising one or more of i) a packer for sealing an annular portion of the borehole and ii) an extendable probe sealing a wall portion of the borehole.

5 35. The system of claim **31**, wherein the control device includes a variable rate pump for drawing fluid into the test volume.

10 36. The system of claim **31**, wherein the test volume comprises a variable volume and the control device decreases the pressure of the test volume by varying the volume of the variable volume.

37. The system of claim **36** further comprising a piston in the control device for varying the volume of the variable volume.

15 38. The system of claim **31**, wherein at least one characteristic includes a first characteristic determined during the first draw portion and a second characteristic determined during the second draw portion.

20 39. The system of claim **31** further comprising a controller associated with the control device for changing the draw rate when the test volume pressure is below a formation pressure to allow pressure in the test volume to increase toward the formation pressure, the sensing device determining a second characteristic of the test volume during at least

one of A) while pressure in the test volume is increasing; and B) when the pressure in the test volume stabilizes.

40. The system of claim **39**, wherein the control device changes the draw rate by i) 5 changing the draw rate to substantially zero draw rate; and ii) decreasing the rate of increase in draw rate such that flow from the formation is equal to or greater than the tool draw rate.

41. The system of claim **31**, wherein the at least one characteristic includes one or 10 more of i) a draw rate; ii) a piston rate; iii) a piston position; a pump rate; iv) a fluid compressibility; v) a flow rate from the test volume; vi) a flow rate into the test volume; vii) pressure of the test volume; viii) temperature in the test volume; ix) volume of the test volume; and x) composition of fluid in the test volume.

15 42. The system of claim **31**, wherein the programmed instructions include a formation rate analysis program to determine the first characteristic.

43. The system of claim **42**, wherein received output includes the draw rate and 20 compressibility of fluid in the test volume.

44. The system of claim **31**, wherein the control device increases the draw rate by at least one of i) increasing the draw rate continuously during the first draw portion and ii) increasing the draw rate in a step-wise manner during the first draw portion.

45. The system of claim 31, wherein the control device decreases the draw rate by at least one of i) decreasing the draw rate continuously during the second draw portion and ii) decreasing the draw rate in a step-wise manner during the second draw portion.